

Tentative

# Panasonic Liquid Crystal Display Co.,Ltd.

## TECHNICAL DATA

### VVX21F136J00

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## RECORD OF REVISION

| Date | The upper section : Previous revision<br>The lower section : New revision |      | Summary |
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|      |                                                                           |      |         |

## DESCRIPTION

The following specifications are applied to the following IPS-TFT LCD module.

Product Name : VVX21F136J00

Product Factory : Panasonic Liquid Crystal Display Co.,Ltd.

### General Specifications

|                         |                                                                                                                    |          |
|-------------------------|--------------------------------------------------------------------------------------------------------------------|----------|
| Effective display area  | : (H) 432 × (V) 324                                                                                                | (mm)     |
| Number of pixels        | : (H) 1,600 × (V) 1,200                                                                                            | (pixels) |
| Pixel pitch             | : (H) 0.270 × (V) 0.270                                                                                            | (mm)     |
| Color pixel arrangement | : R+G+B vertical stripe                                                                                            |          |
| Display mode            | : Transmissive mode<br>Normally black mode                                                                         |          |
| Top polarizer type      | : Anti-Glare                                                                                                       |          |
| Number of colors        | : 16,777,216                                                                                                       | (colors) |
| Viewing angle range     | : Wide version<br>(Horizontal & Vertical : 178° at $\phi=0^\circ, 90^\circ, 180^\circ, 270^\circ$ , CR $\geq 10$ ) |          |
| Input signal            | : LVDS (LVDS : Low voltage differential signaling)                                                                 |          |
| Backlight               | : 55 pcs of LED (LED : Light-emitting diode)                                                                       |          |
| External dimensions     | : Typ. (H) 456 × (V) 349.5 × (T)22                                                                                 | (mm)     |
| Weight                  | : Typ. (2,800)                                                                                                     | (g)      |

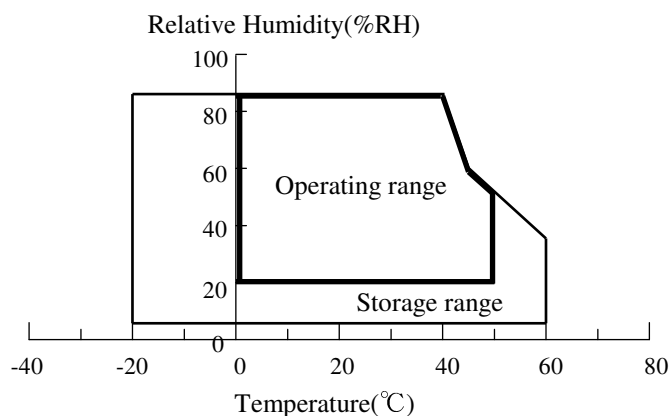
# 1. ABSOLUTE MAXIMUM RATINGS

## 1.1 Environmental Absolute Maximum Ratings

| ITEM                        | Operating      |            | Storage        |             | UNIT             | NOTE     |
|-----------------------------|----------------|------------|----------------|-------------|------------------|----------|
|                             | Min.           | Max.       | Min.           | Max.        |                  |          |
| Temperature                 | 0              | 50         | -20            | 60          | °C               | 1),5),6) |
| Humidity                    | 2)             |            | 2)             |             | %RH              | 1)       |
| Vibration                   | -              | 4.9(0.5 G) | -              | 14.7(1.5 G) | m/s <sup>2</sup> | 3)       |
| Shock                       | -              | 29.4(3 G)  | -              | 294(30 G)   | m/s <sup>2</sup> | 4),5)    |
| Corrosive Gas               | Not Acceptable |            | Not Acceptable |             | -                |          |
| Illumination at LCD Surface | -              | 50,000     | -              | 50,000      | 1x               |          |

Note 1) Temperature and Humidity should be applied to the glass surface of a TFT LCD module, not to the system installed with a module.

- 2)  $T_a \leq 40^\circ\text{C}$  ..... Relative humidity should be less than 85 %RH max. Dew is prohibited.  
 $T_a > 40^\circ\text{C}$  ..... Relative humidity should be lower than the moisture of the 85 %RH at  $40^\circ\text{C}$ .



- 3) Frequency of the vibration is between 15 Hz and 100 Hz. (Remove the resonance point) 1 hour.
- 4) Direction :  $\pm X$ ,  $\pm Y$ ,  $\pm Z$  (One time each direction)
- 5) Pulse width of the shock is 10 ms.
- 6) The temperature of LCD front surface would be  $65^\circ\text{C}$  in operating, it may affect the optical characteristics however it does not damage the function of the module.

## 1. 2 Electrical Absolute Maximum Ratings

(1)TFT-LCD module

GND=0V

| ITEM                     | SYMBOL            | Min. | Max. | UNIT | NOTE  |
|--------------------------|-------------------|------|------|------|-------|
| Power supply voltage     | VDD               | -0.3 | 6.5  | V    |       |
| Input Voltage for logic  | V1                | -0.3 | 4.0  | V    | 1)    |
| Electrostatic Durability | V <sub>ESD0</sub> | ±100 |      | V    | 2),3) |
|                          | V <sub>ESD1</sub> | ±8   |      | kV   | 2),4) |

- Note
- 1) It is applied to pixel data signal, clock signal and other control signals.
  - 2) Discharge Coefficient : 250 pF - 100 Ω, Environmental : 25 °C - 70%RH
  - 3) It is applied to I/F connector pins.
  - 4) It is applied to the surface of a metallic bezel and a LCD panel.

(2) Backlight unit

| ITEM                        | SYMBOL         | Max. | UNIT      | NOTE |
|-----------------------------|----------------|------|-----------|------|
| Temperature Junction of LED | T <sub>j</sub> | 120  | °C        | 1)   |
| Forward Current             | I <sub>f</sub> | 90   | mA/string | 2)   |

- Note
- 1) The specification shall be applied to each LED.
  - 2) The specification shall be applied at connector pins for LED at start-up.

## 2. INITIAL OPTICAL CHARACTERISTICS

The following optical characteristics are measured under stable conditions. It takes about 30 minutes to reach stable conditions. The measuring point is the center of display area unless otherwise noted.

The optical characteristics should be measured in a dark room or equivalent state.

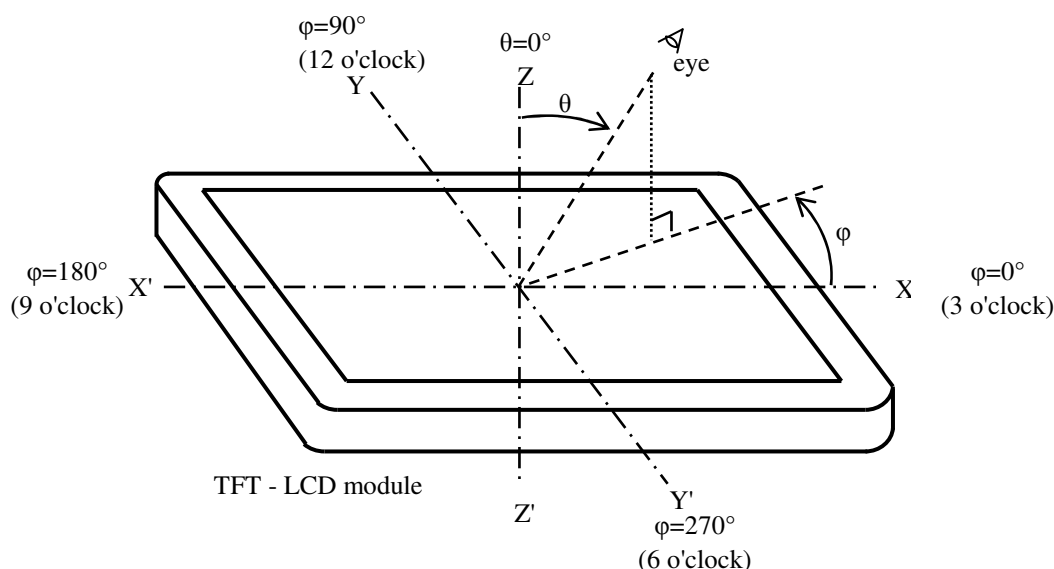
Measuring equipment : CS-1000A, or equivalent

Ambient Temperature =25 °C , f v=60 Hz ,

Ifc = 60mA/string

| ITEM                              | SYMBOL           | CONDITION                                               | Min.      | Typ.    | Max.    | UNIT              | NOTE                    |
|-----------------------------------|------------------|---------------------------------------------------------|-----------|---------|---------|-------------------|-------------------------|
| Contrast ratio                    | CR               | $\theta = 0^\circ$<br>1)                                | (800)     | (1400)  | -       | -                 | 2)                      |
| Response time                     | Rise             |                                                         | -         | (11)    | (20)    | ms                | 3)                      |
|                                   | Fall             |                                                         | -         | (9)     | (20)    | ms                | 3)                      |
| Brightness of white               | B <sub>wh</sub>  |                                                         | (340)     | (440)   | -       | cd/m <sup>2</sup> |                         |
| Brightness uniformity             | B <sub>uni</sub> |                                                         | -         | -       | (25)    | %                 | 4)                      |
| Color chromaticity (CIE)          | Red              | x                                                       | (0.625)   | (0.655) | (0.685) | -                 | 【Gray scale =255】       |
|                                   |                  | y                                                       | (0.300)   | (0.330) | (0.360) |                   |                         |
|                                   | Green            | x                                                       | (0.275)   | (0.305) | (0.335) |                   |                         |
|                                   |                  | y                                                       | (0.595)   | (0.625) | (0.655) |                   |                         |
|                                   | Blue             | x                                                       | (0.120)   | (0.150) | (0.180) |                   |                         |
|                                   |                  | y                                                       | (0.045)   | (0.075) | (0.105) |                   |                         |
|                                   | White            | x                                                       | (0.270)   | (0.300) | (0.330) |                   |                         |
|                                   |                  | y                                                       | (0.310)   | (0.340) | (0.370) |                   |                         |
| Variation of color position (CIE) | Red              | $\Delta x$                                              | -         | -       | 0.04    | -                 | 5)<br>【Gray scale =255】 |
|                                   |                  | $\Delta y$                                              | -         | -       | 0.04    |                   |                         |
|                                   | Green            | $\Delta x$                                              | -         | -       | 0.04    |                   |                         |
|                                   |                  | $\Delta y$                                              | -         | -       | 0.04    |                   |                         |
|                                   | Blue             | $\Delta x$                                              | -         | -       | 0.04    |                   |                         |
|                                   |                  | $\Delta y$                                              | -         | -       | 0.04    |                   |                         |
|                                   | White            | $\Delta x$                                              | -         | -       | 0.04    |                   |                         |
|                                   |                  | $\Delta y$                                              | -         | -       | 0.04    |                   |                         |
| Contrast ratio at 89 °            | CR89             | $\varphi=0^\circ, 90^\circ, 180^\circ, 270^\circ$<br>6) | 10        | -       | -       | -                 | Estimated value         |
| Image sticking                    | -                | Mosaic pattern                                          | Invisible |         |         | -                 | 7)                      |

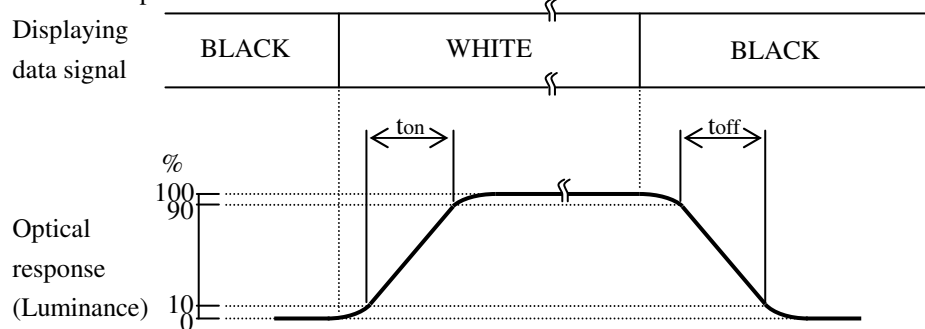
Note 1) Definition of viewing angle



Note 2) Definition of contrast ratio (CR)

$$CR = \frac{\text{(Luminance at displaying WHITE)}}{\text{(Luminance at displaying BLACK)}}$$

3) Definition of response time



4) Definition of brightness uniformity

Display pattern is white (255 level) . The brightness uniformity is defined as the following equation. Brightness at each point is measured, and average, maximum and minimum brightness is calculated.

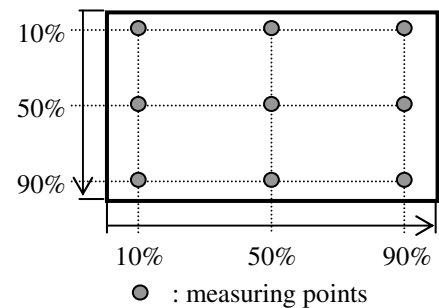
$$B_{uni} = \frac{|B_{max} \text{ or } B_{min} - B_{ave}|}{B_{ave}} \times 100$$

where,  $B_{max}$  = Maximum brightness

$B_{min}$  = Minimum brightness

$B_{ave}$  = Average brightness

$$B_{ave} = \frac{\sum_{k=1}^9 (B(k))}{9}$$



5) Variation of color position on CIE

Variation of color position on CIE is defined as difference between colors at  $\theta = 0^\circ$  and at  $\theta = 50^\circ$  &  $\varphi = 0^\circ, 90^\circ, 180^\circ, 270^\circ$ .

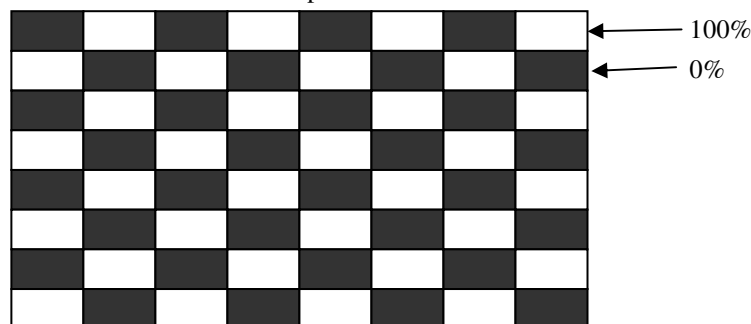
6) Contrast ratio at  $89^\circ$

Evaluation conditions are on horizontal & vertical axis

7) Image sticking

Condition : Operating mosaic pattern for 2 hours and gray scale ( 22 % ) for 1 hour.

Mosaic pattern



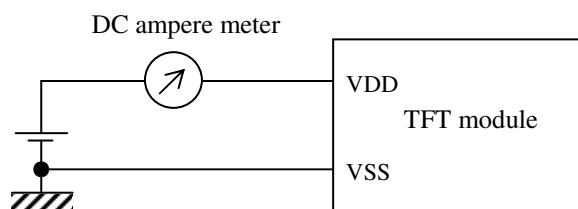
### 3. ELECTRICAL CHARACTERISTICS

#### 3.1 TFT-LCD module

Ta = 25 °C , GND = 0 V

| ITEM                           | SYMBOL | Min. | Typ.  | Max.  | UNIT | NOTE  |
|--------------------------------|--------|------|-------|-------|------|-------|
| Power supply voltage           | VDD    | 4.5  | 5.0   | 5.5   | V    |       |
| Power supply current           | IDD    | -    | (0.7) | (1.0) | A    | 1),2) |
| Ripple voltage of power supply | VDDR   | -    | -     | (500) | mV   |       |

Note 1) fV=60.0Hz, DCLK=65.125MHz, VDD=5.0V, and display pattern is white.



- 2) Current fuse is built in a module. Current capacity of power supply for VDD should be larger than 4[A], so that the fuse can be opened at the trouble of electrical circuit of module.

#### 3.2 Backlight unit

Ta = 25 °C , Vss = 0 V

| ITEM                                  | SYMBOL    | Min.     | Typ.   | Max.   | UNIT   | NOTE            |
|---------------------------------------|-----------|----------|--------|--------|--------|-----------------|
| Forward Current<br>(One LED Assembly) | Anode     | Ifa      | -      | 300    | 315    | mA/array        |
|                                       | Cathode   | Ifc      | -      | 60     | 63     | mA/string       |
| Forward Voltage                       | String    | Vf       | (60.7) | (65.2) | (69.6) | V               |
|                                       | Variation | Vf(unit) | -      | -      | (3)    | V               |
| Power Consumption                     | Pbl       | -        | (20)   | (21)   | W      | Ifc=60mA/string |
| LED Life time                         | -         | 30000    | -      | -      | h      | 2)              |

One Backlight Unit : 1 LED Array.

One LED Array : 5 LED String.

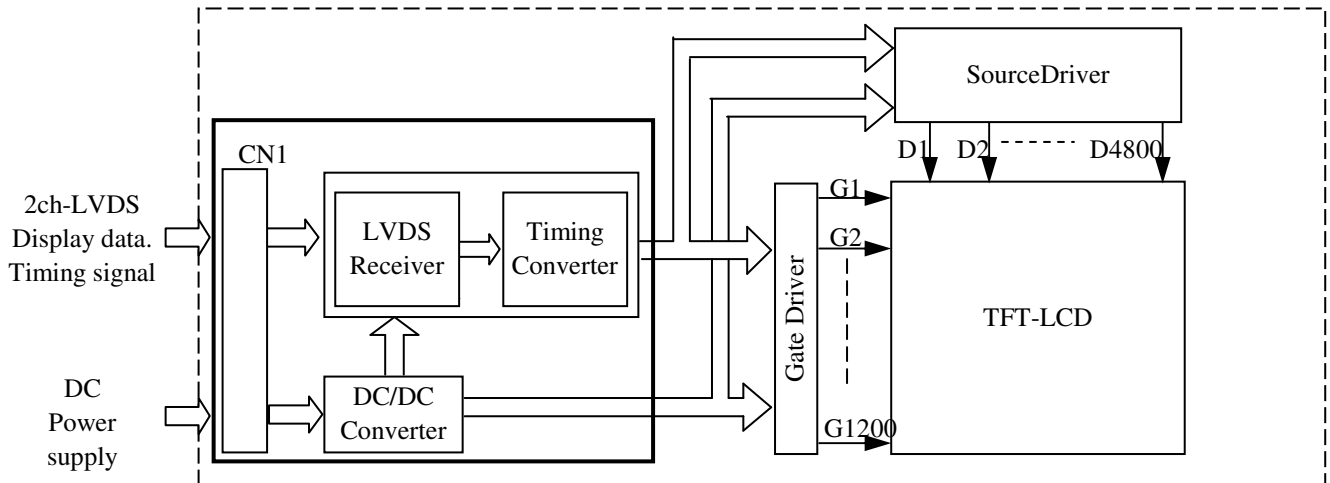
One LED String : 11 LED package.

- Note 1) This characteristics should be applied putting on the LED about 60 minutes later with ambient temperature. ( Ta = 25 °C ± 2 °C )
- 2) Life time of a LED is defined as follows. The life is determined as the time at which brightness of the LED is 50 % compared to that of initial value at that typical forward current on condition of continuous operating at 25 ± 2 °C.

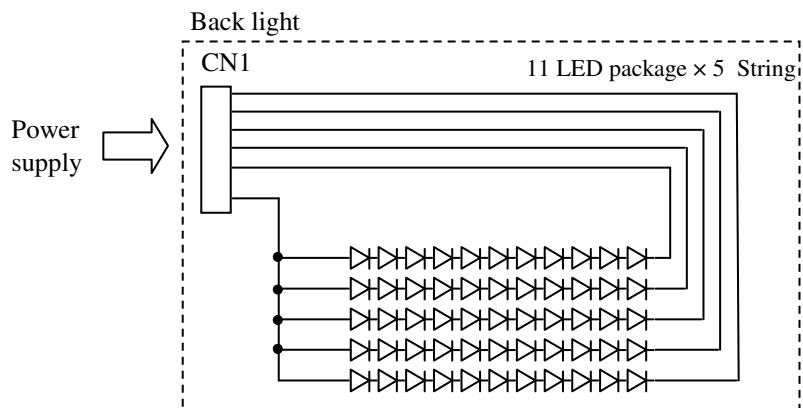


## 4. BLOCK DIAGRAM

### 4.1 TFT-LCD module



### 4.2 Backlight unit



## 5. INTERFACE PIN ASSIGNMENT

### 5.1 TFT-LCD module

<CN1:JAE FI-X30SSLA-HF >

| PIN No. | SYMBOL | DESCRIPTION              | NOTE |
|---------|--------|--------------------------|------|
| 1       | RxA0-  | LVDS<br>Odd Pixel Data   | 1)   |
| 2       | RxA0+  |                          |      |
| 3       | RxA1-  | LVDS<br>Odd Pixel Data   | 1)   |
| 4       | RxA1+  |                          |      |
| 5       | RxA2-  | LVDS<br>Odd Pixel Data   | 1)   |
| 6       | RxA2+  |                          |      |
| 7       | GND    | Ground(0V)               | 2)   |
| 8       | RxAC-  | LVDS<br>Odd Pixel Clock  | 1)   |
| 9       | RxAC+  |                          |      |
| 10      | RxA3-  | LVDS<br>Odd Pixel Data   | 1)   |
| 11      | RxA3+  |                          |      |
| 12      | RxB0-  | LVDS<br>Even Pixel Data  | 1)   |
| 13      | RxB0+  |                          |      |
| 14      | GND    | Ground(0V)               | 2)   |
| 15      | RxB1-  | LVDS<br>Even Pixel Data  | 1)   |
| 16      | RxB1+  |                          |      |
| 17      | GND    | Ground(0V)               | 2)   |
| 18      | RxB2-  | LVDS<br>Even Pixel Data  | 1)   |
| 19      | RxB2+  |                          |      |
| 20      | RxBC-  | LVDS<br>Even Pixel Clock | 1)   |
| 21      | RxBC+  |                          |      |
| 22      | RxB3-  | LVDS<br>Even Pixel Clock | 1)   |
| 23      | RxB3+  |                          |      |
| 24      | GND    | Ground(0V)               | 2)   |
| 25      | NC     | No Connection            |      |
| 26      | NC     | No Connection            |      |
| 27      | NC     | No Connection            |      |
| 28      | VDD    | Power Supply             | 3)   |
| 29      | VDD    |                          |      |
| 30      | VDD    |                          |      |

Notes 1) RxAn+/-, RxBn+/-, (n=0~5), CLKA+/- and CLKB+/- should be wired by side-by-side FPC patterns, respectively.

2) All GND pins shall be grounded. Metal bezel is internally connected to GND.

3) All VDD pins shall be connected to +5.0V(Typ.).

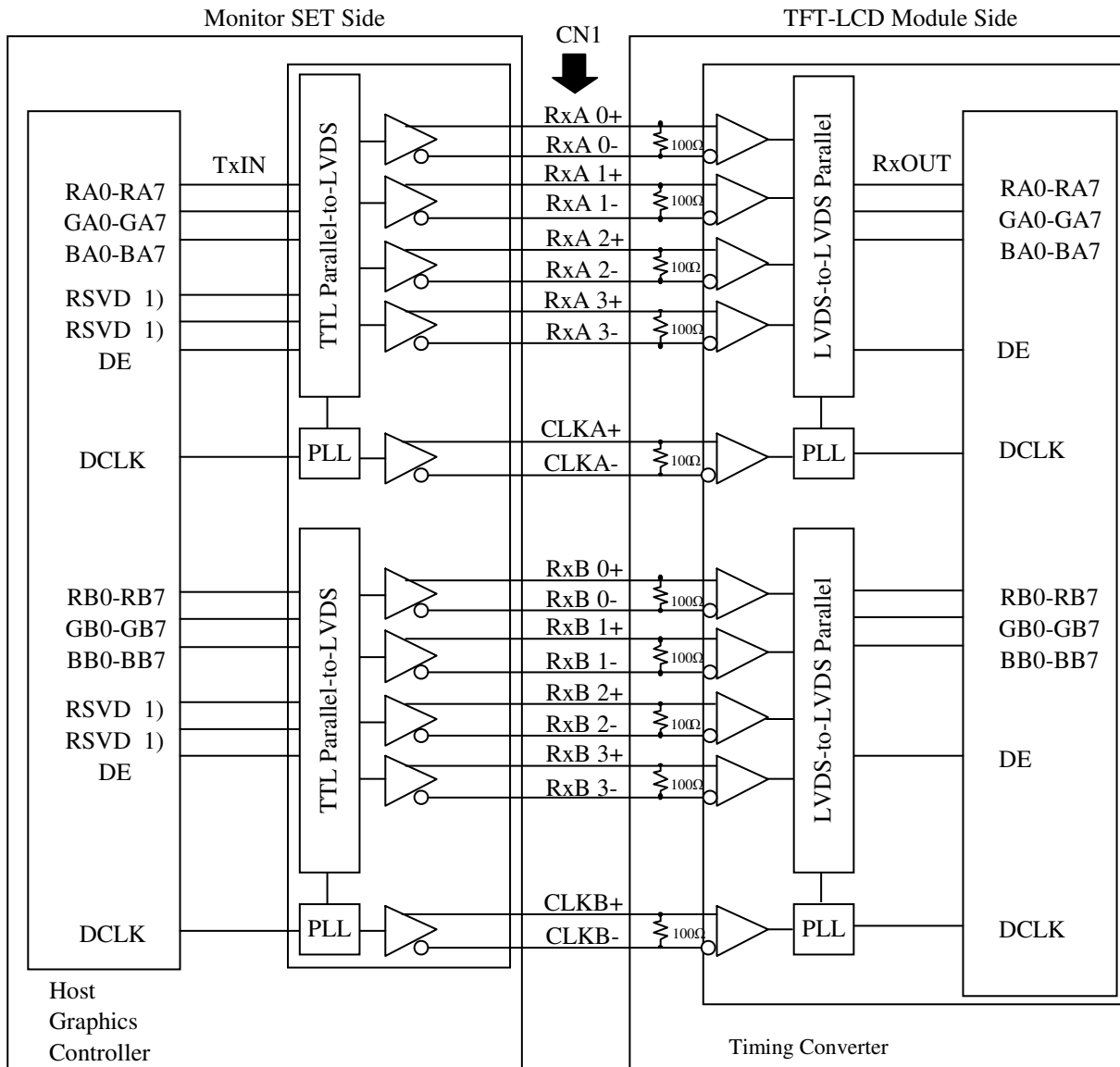
## 5. 2 Back light unit

CN1:(JST PHR-10)

(Matching connector : JST S10B-PH)

| PIN No. | DESCRIPTION | NOTE |
|---------|-------------|------|
| 1       | Cathode     |      |
| 2       | Cathode     |      |
| 3       | Cathode     |      |
| 4       | Cathode     |      |
| 5       | Cathode     |      |
| 6       | NC          |      |
| 7       | NC          |      |
| 8       | NC          |      |
| 9       | Anode       |      |
| 10      | Anode       |      |

### 5.3 Block diagram of interface



RA0~RA7, RB0~RB7 : Pixel R Data (7; MSB, 0; LSB)  
 GA0~GA7, GB0~GB7 : Pixel G Data (7; MSB, 0; LSB)  
 BA0~BA7, BB0~BB7 : Pixel B Data (7; MSB, 0; LSB)  
 DE : Data Enable

- Note 1) The system must have the transmitter to drive the module.  
 2) LVDS cable impedance shall be 50 ohms per signal line or about 100 ohms per twist-pair line when it is used differentially.

#### 5. 4 LVDS interface

|       | SIGNAL          | TRANSMITTER<br>THC63LVDM83A |          | INTERFACE CONNECTOR |              | RECEIVER |           | TFT<br>CONTROL  |
|-------|-----------------|-----------------------------|----------|---------------------|--------------|----------|-----------|-----------------|
|       |                 | PIN                         | INPUT    | Monitor Set         | TFT-LCD      | PIN      | OUTPUT    | INPUT           |
| 24bit | RA0/RB0         | 51                          | Tx IN0   | TA OUT0+            | RxA/B 0+     | 27       | Rx OUT0   | RA0/RB0         |
|       | RA1/RB1         | 52                          | Tx IN1   |                     |              | 29       | Rx OUT1   | RA1/RB1         |
|       | RA2/RB2         | 54                          | Tx IN2   |                     |              | 30       | Rx OUT2   | RA2/RB2         |
|       | RA3/RB3         | 55                          | Tx IN3   |                     |              | 32       | Rx OUT3   | RA3/RB3         |
|       | RA4/RB4         | 56                          | Tx IN4   |                     |              | 33       | Rx OUT4   | RA4/RB4         |
|       | RA5/RB5         | 3                           | Tx IN6   |                     |              | 35       | Rx OUT6   | RA5/RB5         |
|       | GA0/GB0         | 4                           | Tx IN7   | TA OUT0-            | RxA/B 0-     | 37       | Rx OUT7   | GA0/GB0         |
|       | GA1/GB1         | 6                           | Tx IN8   |                     |              | 38       | Rx OUT8   | GA1/GB1         |
|       | GA2/GB2         | 7                           | Tx IN9   |                     |              | 39       | Rx OUT9   | GA2/GB2         |
|       | GA3/GB3         | 11                          | Tx IN12  |                     |              | 43       | Rx OUT12  | GA3/GB3         |
|       | GA4/GB4         | 12                          | Tx IN13  |                     |              | 45       | Rx OUT13  | GA4/GB4         |
|       | GA5/GB5         | 14                          | Tx IN14  |                     |              | 46       | Rx OUT14  | GA5/GB5         |
|       | BA0/BB0         | 15                          | Tx IN15  | TA OUT1+            | RxA/B 1+     | 47       | Rx OUT15  | BA0/BB0         |
|       | BA1/BB1         | 19                          | Tx IN18  |                     |              | 51       | Rx OUT18  | BA1/BB1         |
|       | BA2/BB2         | 20                          | Tx IN19  |                     |              | 53       | Rx OUT19  | BA2/BB2         |
|       | BA3/BB3         | 22                          | Tx IN20  |                     |              | 54       | Rx OUT20  | BA3/BB3         |
|       | BA4/BB4         | 23                          | Tx IN21  |                     |              | 55       | Rx OUT21  | BA4/BB4         |
|       | BA5/BB5         | 24                          | Tx IN22  |                     |              | 1        | Rx OUT22  | BA5/BB5         |
|       | HSYNC or RSVD1) | 27                          | Tx IN24  | TA OUT1-            | RxA/B 1-     | 3        | Rx OUT24  | HSYNC or RSVD1) |
|       | VSYNC or RSVD1) | 28                          | Tx IN25  |                     |              | 5        | Rx OUT25  | VSYNC or RSVD1) |
|       | DE/DE           | 30                          | Tx IN26  |                     |              | 6        | Rx OUT26  | DE/DE           |
|       | RA6/RB6         | 50                          | Tx IN27  |                     |              | 7        | Rx OUT27  | RA6/RB6         |
|       | RA7/RB7         | 2                           | Tx IN5   |                     |              | 34       | Rx OUT5   | RA7/RB7         |
|       | GA6/GB6         | 8                           | Tx IN10  | TA OUT2+            | RxA/B 2+     | 41       | Rx OUT10  | GA6/GB6         |
|       | GA7/GB7         | 10                          | Tx IN11  |                     |              | 42       | Rx OUT11  | GA7/GB7         |
|       | BA6/BB6         | 16                          | Tx IN16  |                     |              | 49       | Rx OUT16  | BA6/BB6         |
|       | BA7/BB7         | 18                          | Tx IN17  |                     |              | 50       | Rx OUT17  | BA7/BB7         |
|       | RSVD 1)         | 25                          | Tx IN23  |                     |              | 2        | Rx OUT23  | RSVD 1)         |
|       |                 |                             |          | TA OUT2-            | RxA/B 2-     |          |           |                 |
|       |                 |                             |          |                     |              |          |           |                 |
|       |                 |                             |          |                     |              |          |           |                 |
|       |                 |                             |          |                     |              |          |           |                 |
|       |                 |                             |          |                     |              |          |           |                 |
|       |                 |                             |          |                     |              |          |           |                 |
|       | DCLK            | 31                          | TxCLK IN | TxCLK OUT+          | RxCLKA/B IN+ | 26       | RxCLK OUT | DCLK            |
|       |                 |                             |          | TxCLK OUT-          | RxCLKA/B IN- |          |           |                 |

RA0~RA7, RB0~RB7 : Pixel R Data (7; MSB, 0; LSB)  
 GA0~GA7, GB0~GB7 : Pixel G Data (7; MSB, 0; LSB)  
 BA0~BA7, BB0~BB7 : Pixel B Data (7; MSB, 0; LSB)  
 DE : Data Enable

Note 1) RSVD(reserved) pins on the transmitter shall be tied to"H"or"L".

### 5. 5 Correspondence between input data and display image

Display data of adjacent one pixel is latched during one cycle of DCLK.

|    |       |    |    |       |    |
|----|-------|----|----|-------|----|
|    | (1,1) |    |    | (1,2) |    |
| RA | GA    | BA | RB | GB    | BB |

ODD pixel : RA0 - RA7 : R data

GA0 - GA7 : G data

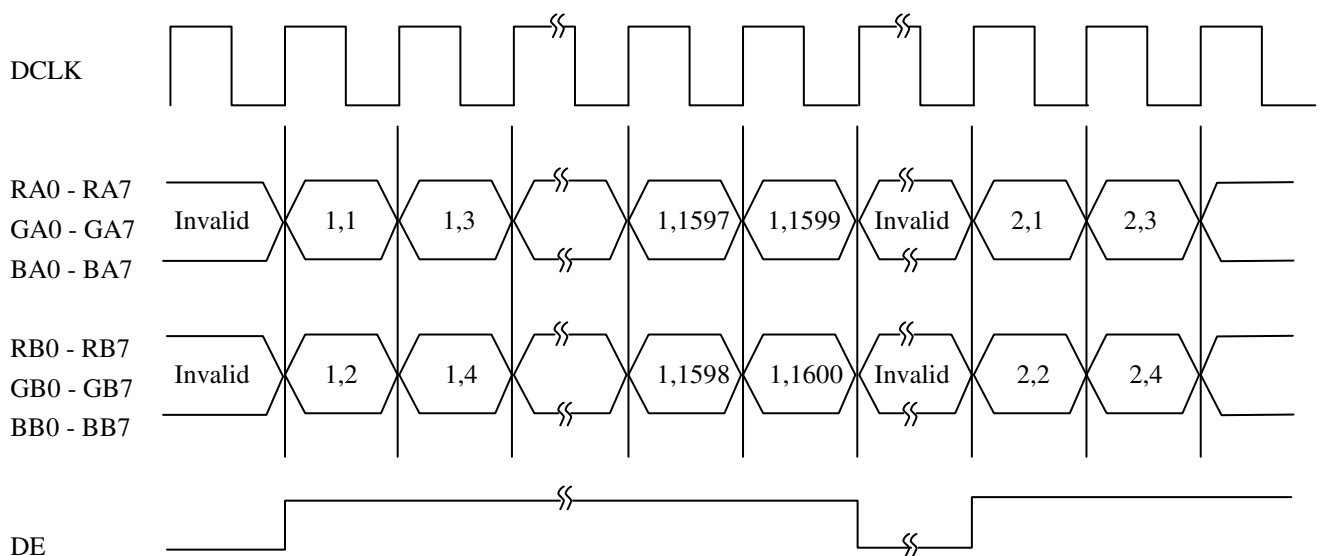
BA0 - BA7 : B data

EVEN pixel RB0 - RB7 : R data

GB0 - GB7 : G data

BB0 - BB7 : B data

|          |          |          |       |             |
|----------|----------|----------|-------|-------------|
| 1 , 1    | 1 , 2    | 1 , 3    | ----- | 1 , 1600    |
| 2 , 1    | 2 , 2    | 2 , 3    | ----- | 2 , 1600    |
| 3 , 1    | 3 , 2    | 3 , 3    | ----- | 3 , 1600    |
| ⋮        | ⋮        | ⋮        |       | ⋮           |
| 1200 , 1 | 1200 , 2 | 1200 , 3 |       | 1200 , 1600 |



## 5. 6 Relationship between display colors and input signals

| Input<br>Color |            | Red Data |    |    |    |     |    |    |    | Green Data |    |    |    |     |    |    |    | Blue Data |    |    |    |     |    |    |    |
|----------------|------------|----------|----|----|----|-----|----|----|----|------------|----|----|----|-----|----|----|----|-----------|----|----|----|-----|----|----|----|
|                |            | R7       | R6 | R5 | R4 | R3  | R2 | R1 | R0 | G7         | G6 | G5 | G4 | G3  | G2 | G1 | G0 | B7        | B6 | B5 | B4 | B3  | B2 | B1 | B0 |
|                |            | MSB      |    |    |    | LSB |    |    |    | MSB        |    |    |    | LSB |    |    |    | MSB       |    |    |    | LSB |    |    |    |
| Basic Color    | Black      | 0        | 0  | 0  | 0  | 0   | 0  | 0  | 0  | 0          | 0  | 0  | 0  | 0   | 0  | 0  | 0  | 0         | 0  | 0  | 0  | 0   | 0  | 0  | 0  |
|                | Red(255)   | 1        | 1  | 1  | 1  | 1   | 1  | 1  | 1  | 0          | 0  | 0  | 0  | 0   | 0  | 0  | 0  | 0         | 0  | 0  | 0  | 0   | 0  | 0  | 0  |
|                | Green(255) | 0        | 0  | 0  | 0  | 0   | 0  | 0  | 0  | 1          | 1  | 1  | 1  | 1   | 1  | 1  | 1  | 0         | 0  | 0  | 0  | 0   | 0  | 0  | 0  |
|                | Blue(255)  | 0        | 0  | 0  | 0  | 0   | 0  | 0  | 0  | 0          | 0  | 0  | 0  | 0   | 0  | 0  | 0  | 1         | 1  | 1  | 1  | 1   | 1  | 1  | 1  |
|                | Cyan       | 0        | 0  | 0  | 0  | 0   | 0  | 0  | 0  | 1          | 1  | 1  | 1  | 1   | 1  | 1  | 1  | 1         | 1  | 1  | 1  | 1   | 1  | 1  | 1  |
|                | Magenta    | 1        | 1  | 1  | 1  | 1   | 1  | 1  | 1  | 0          | 0  | 0  | 0  | 0   | 0  | 0  | 0  | 1         | 1  | 1  | 1  | 1   | 1  | 1  | 1  |
|                | Yellow     | 1        | 1  | 1  | 1  | 1   | 1  | 1  | 1  | 1          | 1  | 1  | 1  | 1   | 1  | 1  | 1  | 0         | 0  | 0  | 0  | 0   | 0  | 0  | 0  |
|                | White      | 1        | 1  | 1  | 1  | 1   | 1  | 1  | 1  | 1          | 1  | 1  | 1  | 1   | 1  | 1  | 1  | 1         | 1  | 1  | 1  | 1   | 1  | 1  | 1  |
| Red            | Black      | 0        | 0  | 0  | 0  | 0   | 0  | 0  | 0  | 0          | 0  | 0  | 0  | 0   | 0  | 0  | 0  | 0         | 0  | 0  | 0  | 0   | 0  | 0  | 0  |
|                | Red (1)    | 0        | 0  | 0  | 0  | 0   | 0  | 0  | 1  | 0          | 0  | 0  | 0  | 0   | 0  | 0  | 0  | 0         | 0  | 0  | 0  | 0   | 0  | 0  | 0  |
|                | Red (2)    | 0        | 0  | 0  | 0  | 0   | 0  | 1  | 0  | 0          | 0  | 0  | 0  | 0   | 0  | 0  | 0  | 0         | 0  | 0  | 0  | 0   | 0  | 0  | 0  |
|                | :          | :        | :  | :  | :  | :   | :  | :  | :  | :          | :  | :  | :  | :   | :  | :  | :  | :         | :  | :  | :  | :   | :  | :  | :  |
|                | :          | :        | :  | :  | :  | :   | :  | :  | :  | :          | :  | :  | :  | :   | :  | :  | :  | :         | :  | :  | :  | :   | :  | :  | :  |
|                | Red(254)   | 1        | 1  | 1  | 1  | 1   | 1  | 1  | 0  | 0          | 0  | 0  | 0  | 0   | 0  | 0  | 0  | 0         | 0  | 0  | 0  | 0   | 0  | 0  | 0  |
|                | Red(255)   | 1        | 1  | 1  | 1  | 1   | 1  | 1  | 1  | 0          | 0  | 0  | 0  | 0   | 0  | 0  | 0  | 0         | 0  | 0  | 0  | 0   | 0  | 0  | 0  |
| Green          | Black      | 0        | 0  | 0  | 0  | 0   | 0  | 0  | 0  | 0          | 0  | 0  | 0  | 0   | 0  | 0  | 0  | 0         | 0  | 0  | 0  | 0   | 0  | 0  | 0  |
|                | Green (1)  | 0        | 0  | 0  | 0  | 0   | 0  | 0  | 0  | 0          | 0  | 0  | 0  | 0   | 0  | 0  | 1  | 0         | 0  | 0  | 0  | 0   | 0  | 0  | 0  |
|                | Green (2)  | 0        | 0  | 0  | 0  | 0   | 0  | 0  | 0  | 0          | 0  | 0  | 0  | 0   | 0  | 1  | 0  | 0         | 0  | 0  | 0  | 0   | 0  | 0  | 0  |
|                | :          | :        | :  | :  | :  | :   | :  | :  | :  | :          | :  | :  | :  | :   | :  | :  | :  | :         | :  | :  | :  | :   | :  | :  | :  |
|                | :          | :        | :  | :  | :  | :   | :  | :  | :  | :          | :  | :  | :  | :   | :  | :  | :  | :         | :  | :  | :  | :   | :  | :  | :  |
|                | Green(254) | 0        | 0  | 0  | 0  | 0   | 0  | 0  | 0  | 1          | 1  | 1  | 1  | 1   | 1  | 1  | 0  | 0         | 0  | 0  | 0  | 0   | 0  | 0  | 0  |
|                | Green(255) | 0        | 0  | 0  | 0  | 0   | 0  | 0  | 0  | 1          | 1  | 1  | 1  | 1   | 1  | 1  | 1  | 0         | 0  | 0  | 0  | 0   | 0  | 0  | 0  |
| Blue           | Black      | 0        | 0  | 0  | 0  | 0   | 0  | 0  | 0  | 0          | 0  | 0  | 0  | 0   | 0  | 0  | 0  | 0         | 0  | 0  | 0  | 0   | 0  | 0  | 0  |
|                | Blue (1)   | 0        | 0  | 0  | 0  | 0   | 0  | 0  | 0  | 0          | 0  | 0  | 0  | 0   | 0  | 0  | 0  | 0         | 0  | 0  | 0  | 0   | 0  | 1  | 0  |
|                | Blue (2)   | 0        | 0  | 0  | 0  | 0   | 0  | 0  | 0  | 0          | 0  | 0  | 0  | 0   | 0  | 0  | 0  | 0         | 0  | 0  | 0  | 0   | 1  | 0  |    |
|                | :          | :        | :  | :  | :  | :   | :  | :  | :  | :          | :  | :  | :  | :   | :  | :  | :  | :         | :  | :  | :  | :   | :  | :  | :  |
|                | :          | :        | :  | :  | :  | :   | :  | :  | :  | :          | :  | :  | :  | :   | :  | :  | :  | :         | :  | :  | :  | :   | :  | :  | :  |
|                | Blue (254) | 0        | 0  | 0  | 0  | 0   | 0  | 0  | 0  | 0          | 0  | 0  | 0  | 0   | 0  | 0  | 0  | 1         | 1  | 1  | 1  | 1   | 1  | 1  | 0  |
|                | Blue (255) | 0        | 0  | 0  | 0  | 0   | 0  | 0  | 0  | 0          | 0  | 0  | 0  | 0   | 0  | 0  | 0  | 1         | 1  | 1  | 1  | 1   | 1  | 1  | 1  |

Note 1) Definition of gray scale :

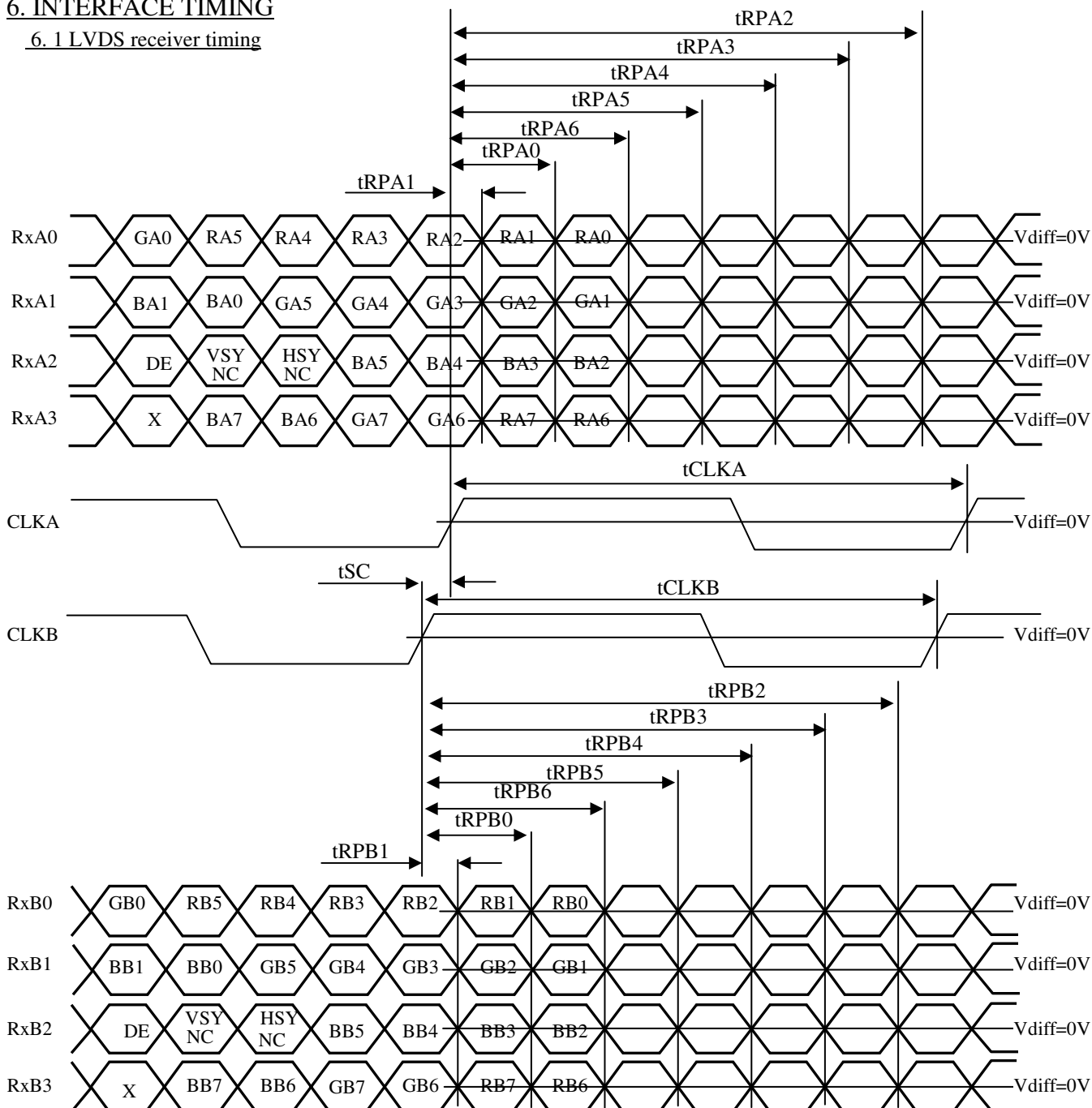
Color(n) · · · · Number in parenthesis indicates gray scale level.

Larger n corresponds to brighter level.

2) Data : 1 : High, 0 : Low

## 6. INTERFACE TIMING

### 6.1 LVDS receiver timing



$$Rx*0=(Rx*0+)-(Rx*0-)$$

$$Rx*3=(Rx*3+)-(Rx*3-)$$

$$Rx*1=(Rx*1+)-(Rx*1-)$$

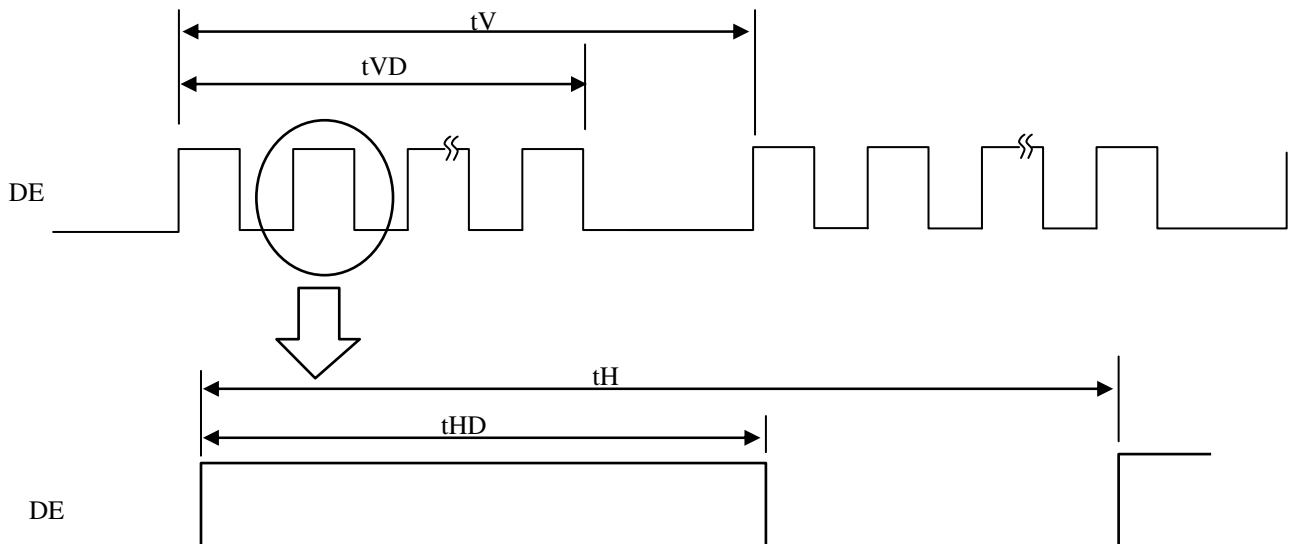
$$CLK=(CLK+)-(CLK-)$$

$$Rx*2=(Rx*2+)-(Rx*2-)$$

| ITEM                         | SYMBOL            | Min. | Typ.          | Max.    | UNIT          | NOTE |
|------------------------------|-------------------|------|---------------|---------|---------------|------|
| CLK                          | Frequency         | DCLK | 62.0          | 65.125  | 67.5          | MHz  |
|                              | CLK Skew          | tSC  | - 4.0         | 0       | + 4.0         | ns   |
| Rx*0<br>Rx*1<br>Rx*2<br>Rx*3 | 0 data position   | tRP0 | 1/7tCLK - 0.4 | 1/7tCLK | 1/7tCLK + 0.4 | ns   |
|                              | 1st data position | tRP1 | - 0.4         | 0       | + 0.4         |      |
|                              | 2nd data position | tRP2 | 6/7tCLK - 0.4 | 6/7tCLK | 6/7tCLK + 0.4 |      |
|                              | 3rd data position | tRP3 | 5/7tCLK - 0.4 | 5/7tCLK | 5/7tCLK + 0.4 |      |
|                              | 4th data position | tRP4 | 4/7tCLK - 0.4 | 4/7tCLK | 4/7tCLK + 0.4 |      |
|                              | 5th data position | tRP5 | 3/7tCLK - 0.4 | 3/7tCLK | 3/7tCLK + 0.4 |      |
|                              | 6th data position | tRP6 | 2/7tCLK - 0.4 | 2/7tCLK | 2/7tCLK + 0.4 |      |



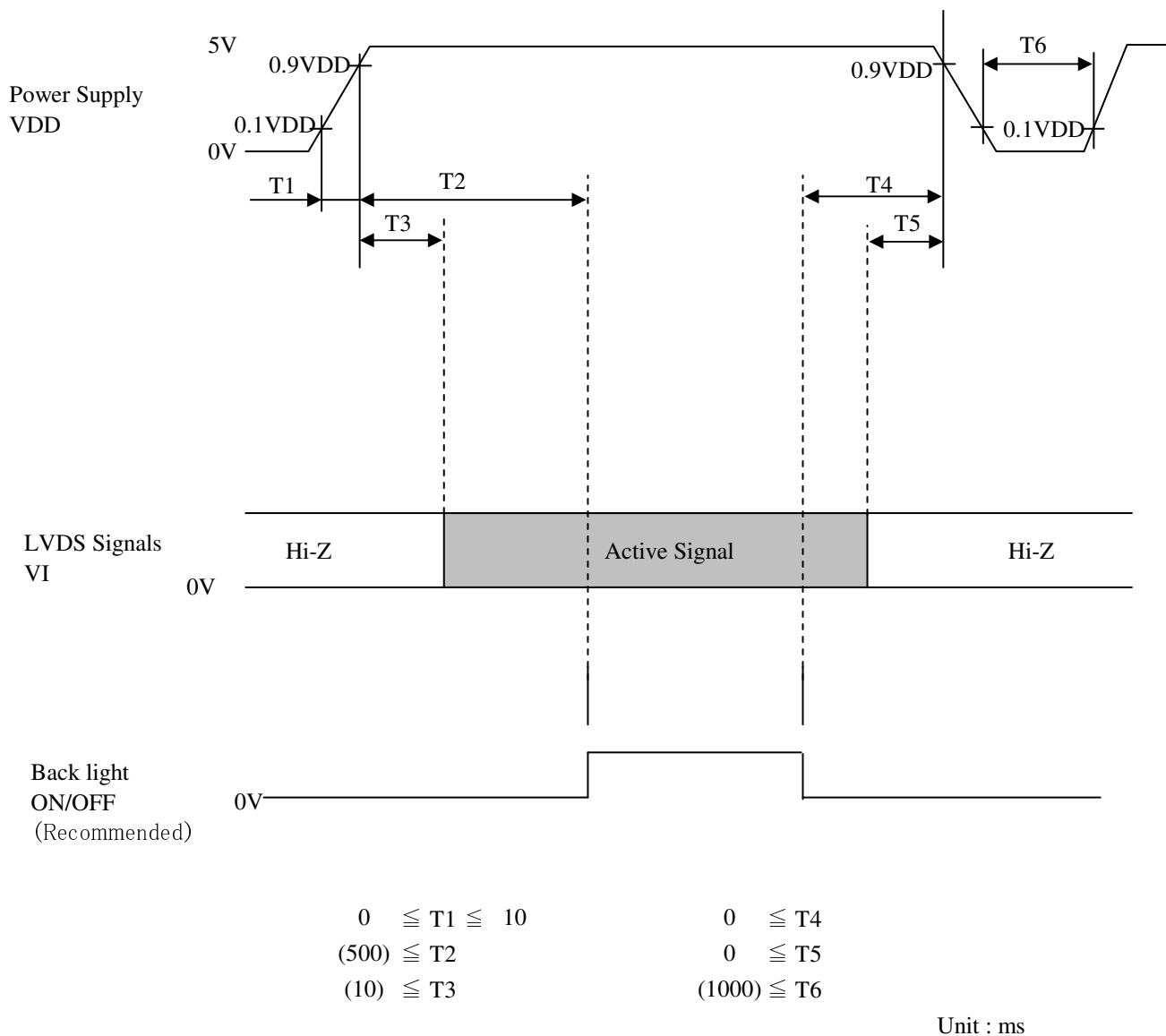
## 6. 2 Synchronization signal timing



Note 1) The timing of DCLK to other signals conforms to the specifications of LVDS transmitter.

|      |                      |        |      |      |      |      | 2pxl/clock |
|------|----------------------|--------|------|------|------|------|------------|
| ITEM |                      | SYMBOL | Min. | Typ. | Max. | UNIT | NOTE       |
| DE   | Vertical Frequency   | fV     | 58   | 60   | 63   | Hz   |            |
|      | Vertical Period      | tV     | 1229 | 1233 | –    | tH   |            |
|      | Vertical Valid       | tVD    | 1200 |      |      | tH   |            |
|      | V-Blanking           | -      | 29   | 33   | –    | tH   |            |
|      | Horizontal Frequency | fH     | 71.5 | 74   | 78   | kHz  |            |
|      | Horizontal Period    | tH     | 850  | 880  | 940  | tCLK |            |
|      | Horizontal Valid     | tHD    | 800  |      |      | tCLK |            |
|      | H-Blanking           | -      | 50   | 80   | 140  | tCLK |            |

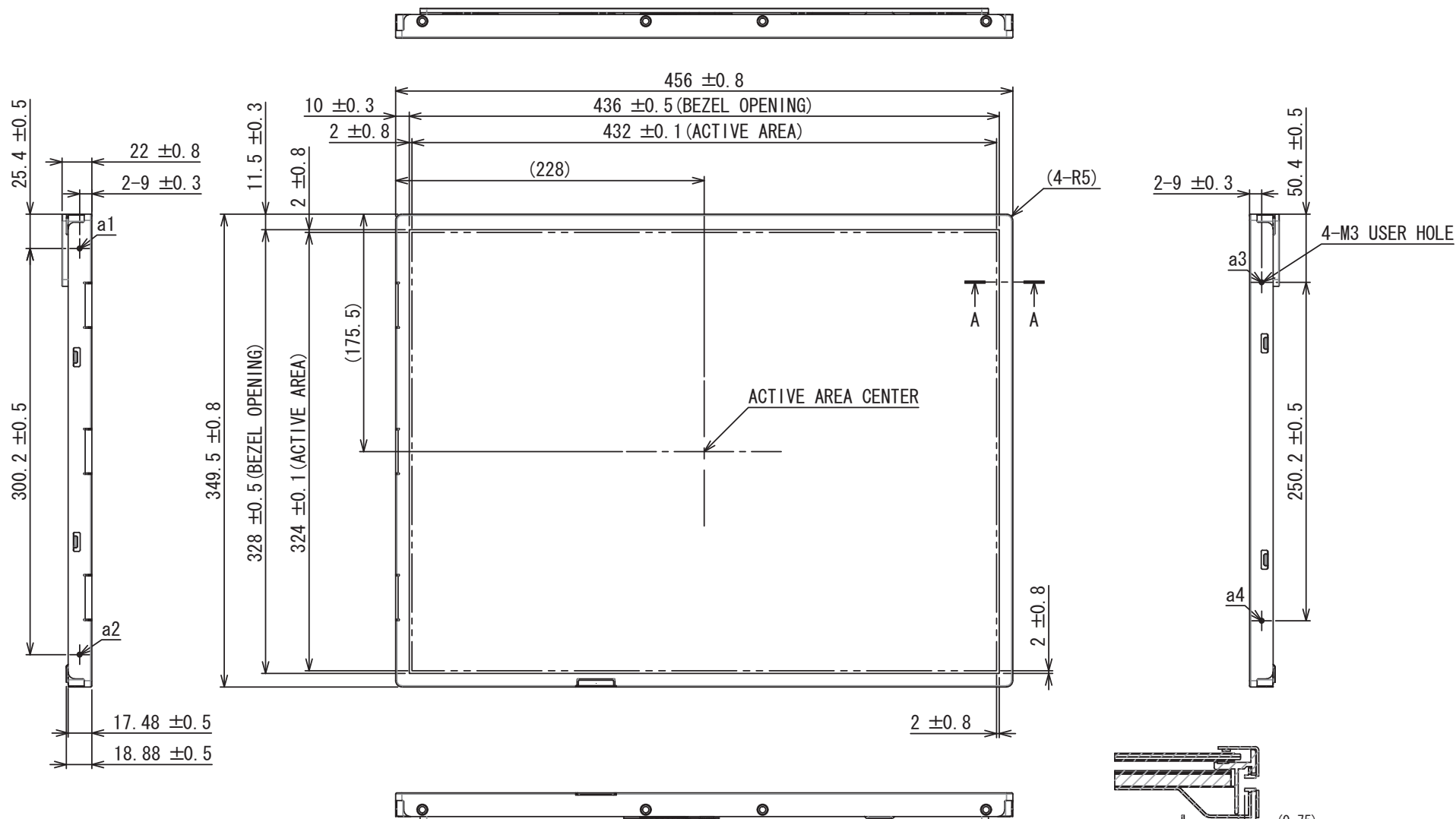
### 6.3 Timing between interface signals power supply



## 7. Dimensional Outline

(1) Front view

**TENTATIVE**  
**For study only.**



Note1) The dimension in a parenthesis is a reference value.

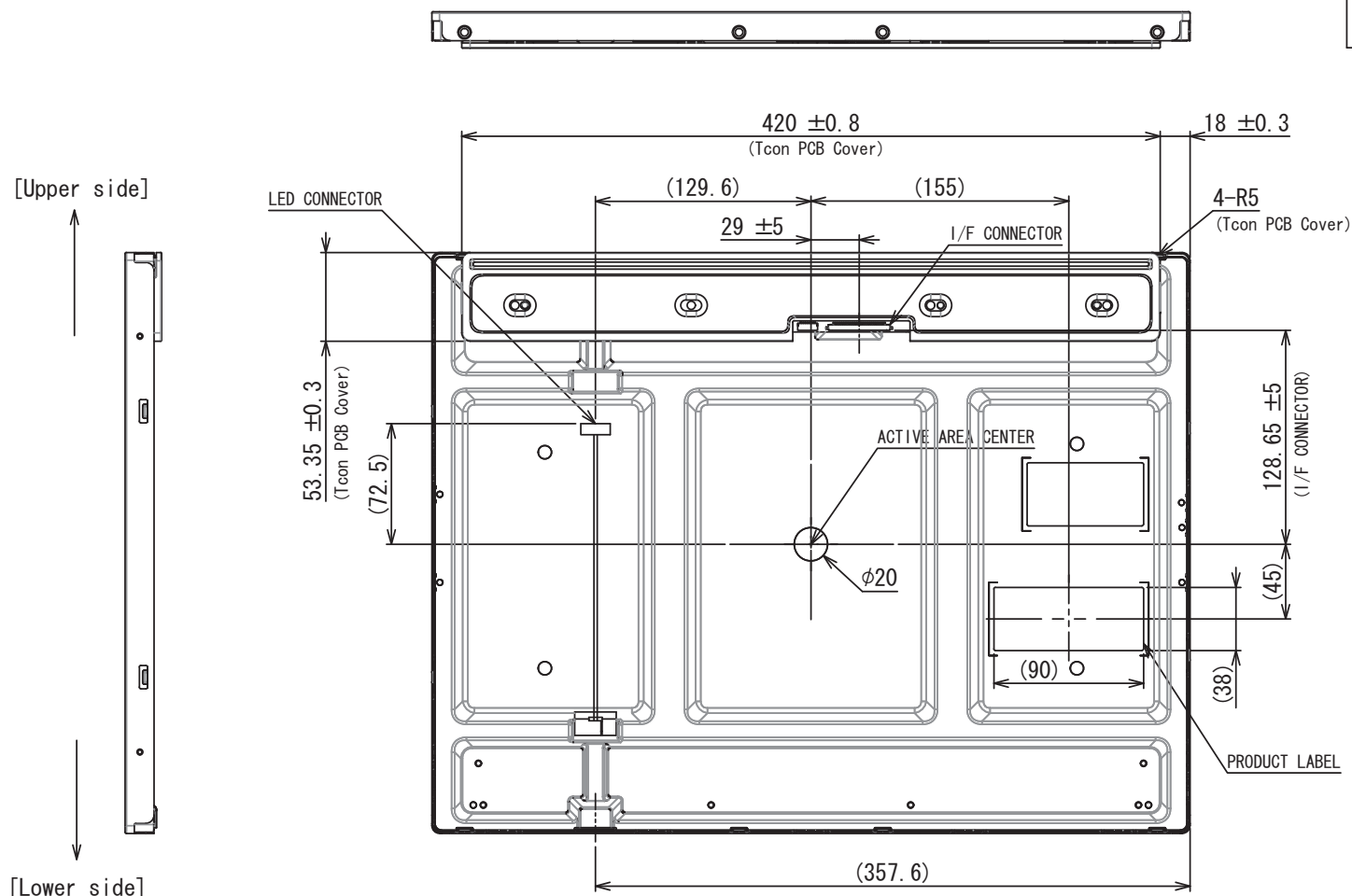
2) The measuring method depends on Panasonic Liquid Crystal Display Co., Ltd standard.

3) Warp quantity  $\leq 1\text{mm}$ .

Section A-A

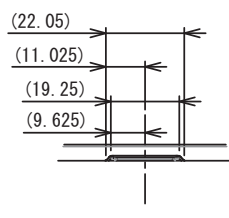
## (2) Back view

**TENTATIVE**  
For study only.



[Upper side]

[Lower side]



Detail C(2:3)



Detail B(1:1)